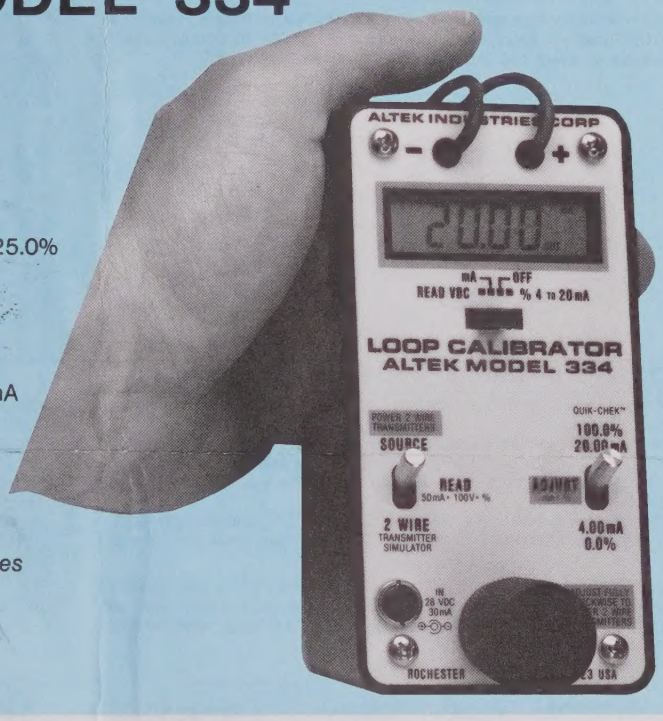
ALTEK

MILLIAMP LOOP CALIBRATOR
MODEL 334

OMEGA CL309



- **ALL 4 TO 20mA LOOP FUNCTIONS**
  Source 0.00 to 24.00mA or −25.0 to 125.0%
  Read mA or Percent to 52.00mA
  Simulate 2-Wire Transmitters
  Measure −99.99 to 99.99 DC Volts
  Power and Read 2-Wire Transmitters
- **"QUIK-CHEK™" SWITCH**
  Instant Zero and Span at 4.00 & 20.00mA
- **FULL 4 DIGIT ACCURACY**
  ±0.05% of 20.00mA Span
  ±0.03% "QUIK-CHEK"
- **STANDARD 9 VOLT BATTERIES**
  Months of use, no nightly recharging
- **OVERLOAD PROTECTED**
  Withstands 135 Volts AC/DC *without fuses*

Altek's Model 334 Loop Calibrator has been designed to check, calibrate and trouble shoot all the signals present within a standard 4 to 20 milliamp process control loop. A 24mA Source, mA meter, 2-Wire Transmitter Simulator and a DC Volt meter are combined into one easy-to-operate instrument.

Dual current ranges allow display of each current function in percent of 4 to 20mA signal, as well as directly in milliamps. In SOURCE MODE, percent range displays −25.0% to +125.0% with 0.1% resolution while the milliamp range displays from 0.00 to 24.00mA with 10μA resolution. In READ MODE the milliamp range displays from 0.00mA to 52.00mA, or percent.

SOURCE MODE uses built in batteries to provide 0.00 to 24.00mA into any load from 0 to 1200. Three 9 volt alkaline batteries provide over 30 hours of continuous 12mA output... more than 3 months of typical use. An optional AC adaptor plugs in for continuous bench use. True current source maintains set output independent of load, "QUIK-CHEK" switch provides instant zero (4.00mA) and full scale (20.00mA) in both SOURCE and 2 WIRE modes. Output in the PERCENT range displays 0.0% and 100.0% for "QUIK-CHEK" settings. ADJUST position selects a continuously adjustable 10 turn potentiometer to allow fast, easy setting to any exact value from 0.00 to 24.00mA. No range change at critical 20.00mA eliminates hysteresis error.

POWER & MEASURE 2-Wire Transmitters simultaneously in Source Mode. The Model 334 supplies the required voltage and displays the current as regulated by the 2-Wire Transmitter.

The Model 334 may also be used when a controller is temporarily removed for repair or replacement. Simply substitute the Model 334 for the controller and use it as a manual loading station.

SIMULATE 2-WIRE TRANSMITTERS by modulating external power to pass 4 to 20mA. The Altek Model 334 uses any loop power from 2 to 100 Volts DC. True current design maintains set current independent of voltage or load changes.

READ MILLIAMPS OR PERCENT of the 4 to 20mA signal. Maximum read current is limited to (nominally) 55mA to minimize the possibility of damaging the device to be calibrated.

MEASURE DC Volts range displays from −99.99 to +99.99 VDC with 10mV resolution. Built in voltmeter is used to check loop power supplies, I/V converters, 1 to 5 Volt signals and battery voltages.

The Model 334 is protected in all ranges to 135 Volts AC or DC. Special protective circuitry withstands accidental misconnection in any mode *without fuses.*

Display digits are 0.4" (10.2mm) high for readability from across the room. Non-glare Liquid Crystal Display is readable in any light... even in direct sunlight. The digital measuring circuit is independent of the current adjustment and measures the actual input or output.

Benchtop accuracy in a toolbox calibrator assures fast, precise setting of current trips, recorders, controllers, loggers, computers and final control elements. Altek brings you the handy Model 334 Loop Calibrator at a cost low enough for every bench and toolbox.

WARRANTY

Our equipment is guaranteed against defective material and workmanship (excluding batteries) for a period of three years from date of shipment. Claims under guarantee can be made by returning the equipment prepaid to our factory. The equipment will be replaced, repaired or adjusted at our option. The liability of Altek is restricted to that given under our guarantee. No responsibility is accepted for damage, loss or other expense incurred through sale or use of our equipment. Under no condition shall Altek be liable for any special, incident or consequential damage.

OTHER PRODUCTS

Altek designs and manufactures fast, accurate instruments for measurement, generation and simulation of virtually every process control signal. Consult our factory directly or your local supplier to order precise, low cost Milliamp, RTD, Thermocouple, Voltage and Frequency Calibrators. Additional models and ranges are frequently added to the Altek instrument family to meet all of your critical calibration requirements.

ALTEK INDUSTRIES CORP
210 Commerce Drive
Rochester, New York 14623 U.S.A.
(716) 334-3720
FAX: (716) 334-6673

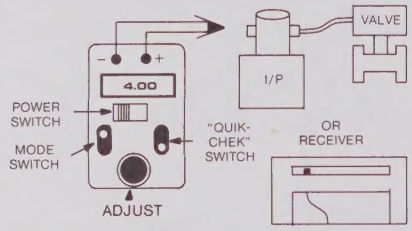
DATA SHEET 334 Additional Milliamp Calibrators: See Data Sheets 134 & 234

OPERATING INSTRUCTIONS

SOURCE MILLIAMPS

1) Disconnect one or both input wires from the device to be calibrated
2) Connect the red lead of the calibrator to the plus (+) input of the device and the black lead to the minus (–)
3) Move the power switch to mA or %

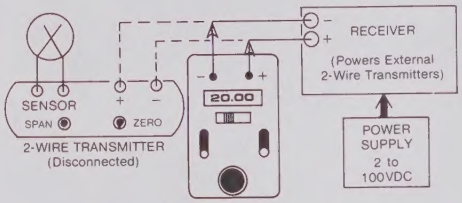
Output current is continuously adjustable with the "QUIK-CHEK™" switch in the ADJUST position. Exact 0.0% (4.00mA) and 100.0% (20.00mA) outputs are available by using the 0.0 and 100.0% "QUIK-CHECKs."



SIMULATE 2-WIRE TRANSMITTERS

1) Disconnect existing 2-Wire transmitter from the loop
2) Put the Mode selector switch into the 2 WIRE position
3) Connect the red lead of the calibrator to the plus (+) terminal of the field connections and the black lead to the minus (–)
4) Move the power switch to mA or %

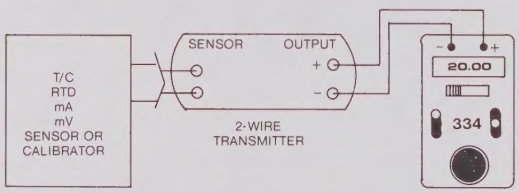
Select the 0.0% (4.00mA) and 100.0% (20.00mA) "QUIK-CHEK" switch positions to quickly calibrate the endpoints of your receivers. Use the ADJUST position and dial to select any value from –25.0 (0.00mA) to 125.0% (24.00mA).



POWER & MEASURE 2-WIRE TRANSMITTERS

1) Disconnect one or both output wires from the 2-Wire Transmitter to be calibrated
2) Connect the red lead of the calibrator to the plus (+) and the black lead to the minus (–) power connections of the 2-Wire Transmitter
3) Connect an appropriate sensor or calibrator to the input of the 2-Wire Transmitter
4) Move the power switch to mA or %, the "QUIK-CHEK" switch to ADJUST, and rotate the knob fully clockwise (see shaded areas on face of unit)

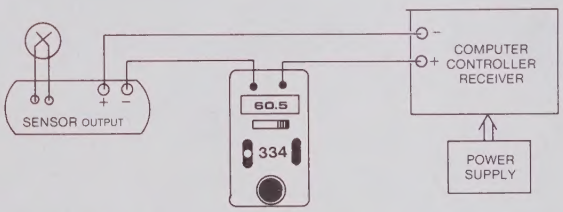
The Model 334 will supply a (nominal) 24 Volts DC to the 2-Wire Transmitter. The milliamp current passed by the transmitter will be accurately displayed. Calibrate the transmitter in the usual manner and disconnect the Model 334.



READ MILLIAMPS

1) Open the current loop at any convenient point along the signal path
2) Connect the red lead of the calibrator to the more positive point of the break and the black lead to the more negative
3) Put the Mode selector switch into the READ position
4) Move the power switch to mA or %. The Model 334 will read current in the loop from 0.00mA to 52.00mA or –25.0% to 300%. Loop current is automatically limited to approximately 55mA to avoid any damage to other devices within the loop. If the Model 334 is accidently connected in the wrong polarity, the display will read 0.00mA or –25.0% and no current will flow in the loop. Simply reverse the leads for correct operation.

Note: "QUIK-CHEK" switch is disabled when reading

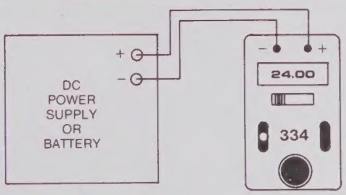


MEASURE VOLTS DC

1) Put the mode switch to READ
2) Move the power switch to READ DCV
3) Connect the red and black leads across the voltage to be measured

Any DC Voltage from –99.99 to +99.99 Volts may be measured. Loop power supplies, signal voltages at receivers, batteries and transmitter voltage drops may be measured. Signals exceeding ±100 VDC will be indicated by OVRLD on the LCD.

Note: "QUIK-CHEK" switch is disabled when reading



SPECIFICATIONS

(Unless otherwise indicated, specifications are in % of 20mA or 100VDC span at 25°C)

GENERAL

ACCURACY: ±0.05% ±1 least significant digit
"QUIK-CHEK", Source & 2-Wire Modes, Accuracy ±0.03%
DISPLAY: Liquid Crystal; 4 Digit, 0.4" (10.2mm) high
TEMPERATURE EFFECT: ±0.008%/°C
BUILT-IN BATTERIES: 3 x 9 Volt Alkaline
AC ADAPTORS: Optional, 120 or 240 VAC, 50/60 Hz
BATTERY LIFE:
SOURCE MODE: 33 hours at 12mA, 20 hours at 20mA output
2-WIRE SIMULATOR or READ MODES: 150 hours
LOW BATTERY INDICATION: BAT indicated on LCD when approximately 1 hour remains driving 12mA into 800 Ohms
OVERVOLTAGE PROTECTION: Protected to 135 Volts AC or DC in all ranges without fuses
OVERLOAD PROTECTION:
SOURCE & 2-WIRE SIMULATOR MODES: Current limited to 25mA
READ MODE: Current limited to 55mA
OPERATING AMBIENT TEMPERATURE: –20 to +60°C (–5 to +140°F)
STORAGE TEMPERATURE: –30 to +70°C (–22 to +160°F)
RELATIVE HUMIDITY: 10 to 90%, non-condensing
WARM UP TIME: 3 seconds to rated accuracy
OVERALL SIZE: 2½ x 2⅝ x 5⅛ inches (63.5 x 66.7 x 130mm)
WEIGHT: 12 oz. (0.35 kg)

ORDERING INFORMATION

	Part No.
MODEL 334: LOOP CALIBRATOR	334-2050
AC Adaptor	28-0120
AC Adaptor	28-0240
CARRYING CASE: Optional, zippered with belt loop	09-3781

SOURCE MODE

RANGES:
0.00 to 24.00mA with 10μA resolution
–25.0 to 125.0% of 4-20mA with 0.1% resolution
TYPICAL DRIVE CAPABILITY: 1200 Ohms with fresh batteries or adaptor, 800 Ohms at low battery indication (BAT)
POWER TO EXTERNAL 2-WIRE TRANSMITTER: Nominal 24 VDC with fresh batteries or adaptor

READ MODE

RANGES:
0.00 to 52.00mA with 10μA resolution
–25.0 to 300.00% of 4-20mA with 0.1% resolution
–99.99 to 99.99 VDC with 10mV resolution, OVRLD at ±100 VDC
INPUT IMPEDANCE: VDC range, >10 Meg Ohms
VOLTAGE BURDEN: 0.8 V at 4.00mA, 1.1 V at 20mA, 1.6 V at 50.00mA

2-WIRE TRANSMITTER SIMULATOR MODE

RANGES:
0.00 to 24.00mA with 10μA resolution
–25.0 to 125.0% of 4-20 mA with 0.1% resolution
LOOP VOLTAGE LIMITS: Minimum, 2 VDC; Maximum 100 VDC

AVAILABLE FROM:

September 1989 Altek Industries Corp 210 Commerce Drive, Rochester, NY 14623 USA

SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® CL309 Loop Calibrator has been designed to check, calibrate and troubleshoot all the signals present within a standard 4 to 20 milliamp process control loop. A 24 mA source, mA meter, two-wire transmitter simulator and a DC voltmeter are combined into one easy-to-operate instrument.

Power and measure two-wire transmitters simultaneously in Source Mode. The CL309 supplies the required voltage and displays the current as regulated by the two-wire transmitter.

Simulate two-wire transmitters by modulating external power to pass 4 to 20 mA. The CL309 uses any loop power from 2 to 100 volts dc.

Read current or percent of the 4 to 20 mA signal. Maximum read current is limited to 55 mA to minimize the possibility of damaging the device to be calibrated.

Measure DC volts from -99.99 to +99.99 Vdc with 10 mV resolution. The built-in voltmeter can be used to check loop power supplies.

1.2 FEATURES

- Simulate and Measure 4 to 20 mA Functions
- Instant 4 and 20 mA Outputs
- 0.05% Accuracy
- Simulate Two-Wire Transmitters
- Read mA or Percent

SECTION 2 UNPACKING

Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department.

Upon receipt of the shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

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SECTION 3 OPERATION

3.1 SOURCE MILLIAMPS

1. Disconnect one or both input wires from the device to be calibrated.
2. Connect the red lead of the calibrator to the plus (+) input of the device and the black lead to the minus (-).
3. Move the power switch to mA or %.

Output current is continuously adjustable with the "QUIK-CHEK" switch in the ADJUST position. Exact 0.0% (4.00 mA) and 100.00% (20.00 mA) outputs are available by using the 0.0 and 100.0% QUIK-CHEK.

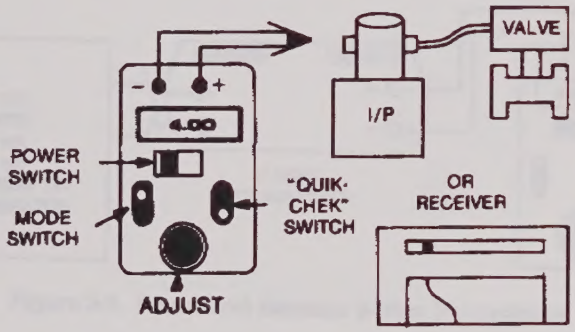

Figure 3-1. Source Mode

3.2 SIMULATE 2-WIRE TRANSMITTERS

1. Disconnect existing two-wire transmitter from the loop.
2. Put the Mode selector switch in the 2-WIRE position.
3. Connect the red lead of the calibrator to the plus (+) terminal of the field connections and the black lead to the minus (-).
4. Move the power switch to mA or %.

Select the 0.0% (4.00 mA) and 100.00% (20.00 mA) QUIK-CHEK switch positions to quickly calibrate the endpoints of your receivers. Use the ADJUST position and dial to select any value from -25.0 (0.00 mA) to 125.0% (24.00 mA).

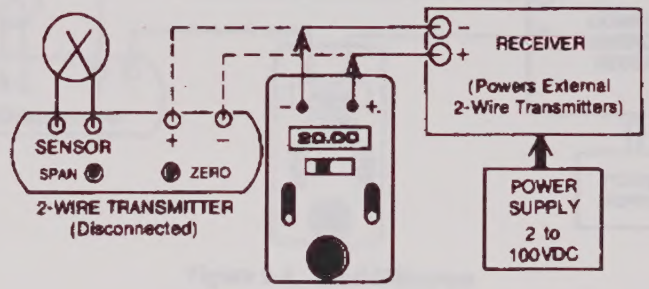

Figure 3-2. Simulate 2-Wire Transmitters

3.3 POWER AND MEASURE 2-WIRE TRANSMITTERS

1. Disconnect one or both output wires from the two-wire transmitter to be calibrated.
2. Connect the red lead of the calibrator to the plus (+) and the black lead to the minus (-) power connections of the two-wire transmitter.
3. Connect an appropriate sensor or calibrator to the input of the two wire transmitter.
4. Move the power switch to mA or %, the QUIK-CHEK switch to ADJUST, and rotate the knob fully clockwise (see shaded areas on face of unit).

The CL309 will supply a (nominal) 24 Volts DC to the two-wire transmitter. The milliamp current passed by the transmitter will be accurately displayed. Calibrate the transmitter in the usual manner and disconnect the CL309.

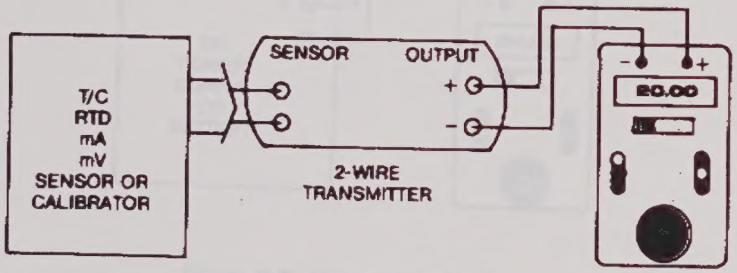

Figure 3-3. Power and Measure 2-Wire Transmitters

3.4 READ MILLIAMPS

1. Open the current loop at any convenient point along the signal path.
2. Connect the red lead of the calibrator to the more positive point of the break and the black lead to the more negative.
3. Put the Mode selector switch into the READ position.
4. Move the power switch to mA or %. The CL309 will read current in the loop from 0.00 mA to 52.00 mA or -25.0% to 300%. Loop current is automatically limited to approximately 55 mA to avoid any damage to other devices within the loop. If the CL309 is accidentally connected in the wrong polarity, the display will read 0.00 mA or -25.0%, and no current will flow in the loop. Simply reverse the leads for correct operation.

Note: QUIK-CHEK switch is disabled when reading.

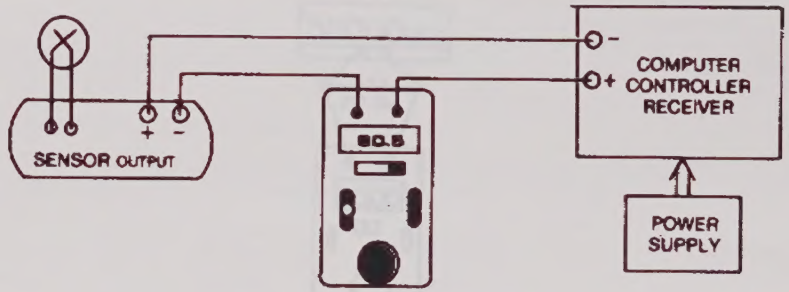

Figure 3-4. Read Milliamps

3.5 MEASURE VOLTS DC

1. Put the Mode switch to READ.
2. Move the power switch to READ DCV.
3. Connect the red and black leads across the voltage to be measured.

Any DC voltage from -99.99 to +99.99 volts may be measured. Loop power supplies, signal voltages at receivers, batteries and transmitter voltage drops may be measured. Signals exceeding ±100 VDC will be indicated by OVRLD on the LCD.

Note: QUIK-CHEK switch is disabled when reading.

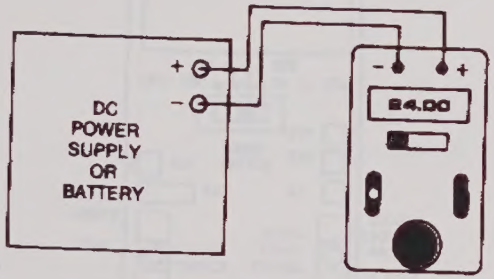

Figure 3-5. Measure DC Volts

SECTION 4 CALIBRATION

4.1 SUGGESTED EQUIPMENT

1. 5 Digit Voltmeter (accuracy ±0.015% of reading or better) with a 250Ω resistor (±0.015% or better). As an alternative, a DC milliammeter (±0.015% or better) may be used, which eliminates the 250Ω resistor.

2. A 20 mA current source with maximum voltage output compliance of 100 VDC. (50 mA current source suggested for optional check only).

3. An adjustable DC power supply, 0 to 100 VDC.

Before any adjustments to the CL309 are made, fresh batteries should be placed in the unit. Connect test equipment as shown in Figure 4-1.

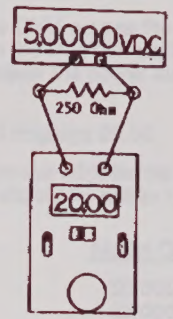

Figure 4-1. Equipment Set-up

4.2 SOURCE MODE, MILLIAMP RANGE

Set the POWER switch to mA, the MODE switch to SOURCE and the QUIK-CHEK switch to 20.00 mA.
Adjust R2 (see Figure 4-2) so that the LCD reads 20.00.
Adjust R23 so that the DVM displays 5.0000 ±0.0015 VDC.
Move the QUIK-CHEK switch to 4.00 mA.
Adjust R5 so that the LCD displays 4.00.
Verify that the DVM reads 1.0000 ±0.0015 VDC.

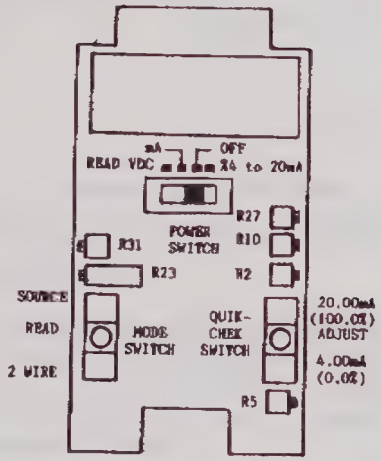

Figure 4-2. Source Mode, Milliamp Range

4.3 SOURCE MODE, PERCENT RANGE

Move the POWER switch to %4 to 20 mA. MODE switch should still be in SOURCE and QUIK-CHEK switch should still be at 4.00 mA/0.0%.

Adjust R10 so that the LCD displays 00.0.

Move the QUIK-CHEK switch to 100.0.%.

Adjust R27 so that the LCD displays 100.0.

Check and readjust the 00.0% and 100.0% adjustments as necessary to obtain desired readings.

4.4 READ VDC RANGE

Connect the CL309 and the DVM across the adjustable power supply as shown in Figure 4-3. Move the POWER switch to READ VDC and the MODE switch to READ. Adjust the power supply so that the DVM reads 95.000 VDC.

Adjust R31 so that the LCD displays 95.00.

Check additional points from the table below to verify proper operation. All readings on the CL309 should be within ± 0.05 VDC.

DVM	Model CL309
50.000	50.000
25.000	25.000
5.000	5.000

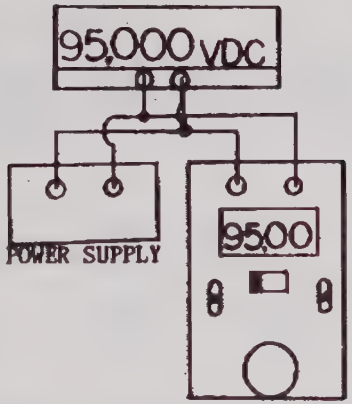

Figure 4-3. Read VDC Range

The remainder of this calibration procedure is a functional check.

4.5 READ MODE CHECK

Place the mA Source in series with the CL309 as shown in Figure 4-4. Move the MODE switch to READ and toggle the POWER switch between mA and %4 to 20 mA as indicated in Table 4-1. Adjust the mA source to obtain the readings on the DVM and compare the readings on the CL309. The Milliamp and Percent readings should all be within ± 2 counts of the values in the table.

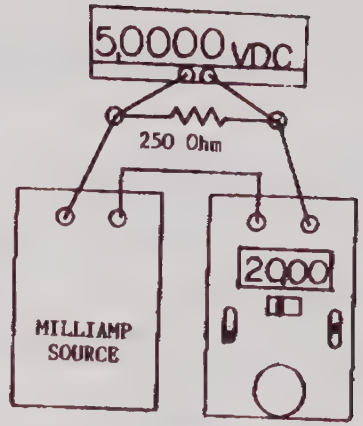

Figure 4-4. Read Mode Check

Table 4-1
Ranges on CL309

mA Source	DVM	Milliamp	Percent
4.00	1.0000	4.00 ±0.02	00.0 ±0.2
8.00	2.0000	8.00 ±0.02	25.0 ±0.2
12.00	3.0000	12.00 ±0.02	50.0 ±0.2
16.00	4.0000	16.00 ±0.02	75.0 ±0.2
20.00	5.0000	20.00 ±0.02	100.0 ±0.2
Optional check			
50.00	12.500	50.00 ±0.02	287.5 ±0.2

4.6 TWO-WIRE MODE CHECK

This check uses the same hookup as the READ MODE check (Figure 4-4). Set the mA source to full output (greater than 20mA). Move the MODE switch to 2 WIRE TRANSMITTER SIMULATOR position. Use the QUIK-CHEK switch and check that both the DVM and the CL309 display as in Table 4-2.

Table 4-2
Ranges on CL309

Milliamp	Percent	DVM
4.00	00.0	1.0000
20.00	100.0	5.0000

If component replacement is required, save and replace the insulating material on the underside of the printed circuit board.

If the unit fails to meet any of its stated specifications after recalibration, contact OMEGA Customer Service Department.

SECTION 5 SPECIFICATIONS

GENERAL

ACCURACY:	±0.05% ±1 digit ±0.03% ±1 digit QUIK-CHEK, Source and 2-Wire Modes
TEMPERATURE EFFECT:	±0.008%/°C
DISPLAY:	LCD; 4 Digit 0.4" (10.2mm) high
OPERATING AMBIENT RANGE:	-5 to 140°F (-20 to 60°C); 10 to 90% RH, non-condensing
STORAGE TEMPERATURE:	-22 to +160°F (-30 to 70°C)
OVER VOLTAGE PROTECTION:	Protected to 135 Vac or Vdc in all ranges without fuses
OVERLOAD PROTECTION	
Source & 2-Wire Simulator Modes:	Current limited to 25 mA
Read Mode:	Current limited to 55 mA
POWER:	3 x 9 volt alkaline batteries. "Bat" indicator appears when approx. 1 hour remains

SPECIFICATIONS (Continued)

BATTERY LIFE

Source Mode:	33 hours at 12 mA, 20 hours at 20 mA output
2-Wire Simulator or Read Mode:	150 hours
DIMENSIONS:	2.5" x 2.625" x 5.125" (63.5 x 66.7 x 130mm)
WEIGHT:	12 oz. (0.35 kg)

SOURCE MODE

RANGES:	0.00 to 24.00 mA with 10µA resolution; -25.0 to 125.0% of 4-20 mA with 0.1% resolution
TYPICAL DRIVE CAPABILITY:	1200Ω with fresh batteries or ac adapter, 800Ω at low battery indication
POWER TO EXTERNAL 2-WIRE TRANSMITTER:	Nominal 24 Vdc with fresh batteries or ac adapter

SPECIFICATIONS (Continued)

READ MODE

RANGES:	0.00 to 52.00 mA with 10µA resolution; -25.0 to 125.0% of 4-20mA with 0.1% resolution; -99.99 to 99.99 Vdc with 10 mV resolution, OVRLD at ±100 Vdc
INPUT IMPEDANCE:	Vdc range, >10MΩ
CL309 VOLTAGE DROP:	0.8 V at 4.00 mA, 1.1 V at 20.00 mA, 1.6 V at 50.00 mA

2-WIRE TRANSMITTER SIMULATION MODE

RANGES:	0.00 to 24.00 mA with 10µA resolution; -25.0 to 125.0% of 4-20 mA with 0.1% resolution
LOOP VOLTAGE LIMITS:	2 Vdc min.; 100 Vdc max.

MP MASTER
MA34219